## REMARKS

Claims 1-28 are pending and stand rejected. The Examiner's reconsideration of the rejections in view of the following remarks and of the amendments to the claims is respectfully requested.

Claims 1-28 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Takahashi et al., (U.S. Patent 6,5,488,629) in view of Lin et al. (US Pat. Appl. # 2004/0038649).

The Examiner stated essentially that Takahashi et al., (U.S. Patent 6,5,488,629) combined with (a "suggest[ion]" in) Lin teaches all the limitations recited in claims 1-28 (e.g., including a "mismatch estimation unit" configured to estimate the "phase mismatch" and the "gain mismatch" in (from) the output signals of the in-phase mixer and the quadrature-phase mixer (of a DCR, direct conversion receiver). The Applicant appreciates and agrees with the Examiner's observation that Takahashi et al., (U.S. Patent 6,5,488,629) itself does NOT teach nor suggest a "mismatch estimation unit that estimates a (phase or gain) mismatch of the in-phase mixer and the quaderature-phase mixer, from the output signals of the in-phase mixer and quadrature-phase mixer" for "adjusting" a such a mismatch. However, Applicant respectfully submits that Lin et al. (US Pat. Appl. # 2004/0038649) also does not teach nor suggest a "mismatch estimation unit". Instead, Lin teaches only a first Automatic Gain Control (AGC) unit (114) operating on the ENTIRE (I combined with Q) Rx signal "prior to downconversion" (0041) and a second Automatic Gain Control (AGC) unit (140) again operating on the ENTIRE (I combined with Q) Rx signal "after upconversion". The AGCs operating on the ENTIRE Rx signal (including all of the

in-phase mixer and quadrature-phase signals) is incapable of measuring, let alone removing, "mismatch".

The background section of the application first describes or defines the term "mismatch" as used in the application as follows:

> "The I-path signal (I_PATH) and Q-path signal (Q_PATH) are baseband signals converted from an RF signal.
>
> "The [conventional] DCR having the structure shown in FIG. 7 usually has a phase and gain mismatch. The phase and gain mismatch in the DCR occurs in the poly-phase filter 130 and the mixer unit 710. Ideally the phase difference of the in-phase differential signal ($I\_W_{RF}$) and the quadrature-phase differential signal ($Q\_W_{RF}$) output from the poly-phase filter 130 is 90°, but the actual phase difference is not. Also, ideally, the phase difference of the first and second local oscillation signals (OS1, OS2) provided to the mixers 711 through 714 is 90° and the gains of the output signals of the mixers 711 through 714 are the same. However, the phase difference of the first and second location oscillation signals (OS1, OS2) is actually $90\pm\Phi$ causing a phase mismatch. Also, a gain mismatch occurs in the output signals of the mixers."

The term "mismatch" as used in the present application and in its claims is implicitly defined as the "mismatch" existing BETWEEN the "I-path signal" and "Q-path signal". Thus, any filtering, or Automatic Gain Control operating uniformly only upon the ENTIRE Rx signal path (combined "I-path signal" and "Q-path signal") is incapable of detecting or estimating, let alone of removing, such a mismatch. Lin does not suggest "detecting" nor "estimating" nor "removing" a mismatch of any sort from the transceiver, but only suggests a way "to avoid introducing an imbalance" (0043-0044). Thus, even if we assume that the "imbalance" of concern to Lin means the same as a "mismatch" in the present application, Lin does not purport to teach detection, estimation, nor removal of such an imbalance or mismatch, but only teaches "to avoid" adding to such as may be present. If anything, the language of Lin (at 0040-0041) assumes that an "imbalance" (or "mismatch") once

"introduced" cannot be REMOVED. Thus, Lin actually teaches away from removing or calibrating for such an imbalance or mismatch.

Additionally, applicant submits that the AGC 114 (FIG. 1 of Lin) of Lin is substantially the same as the AGC 30 (FIG. 5 of Takahashi) of Takahashi and that neither AGC performs nor suggests any detection, estimation, or removal of an imbalance or "mismatch" between the "I-path signal" and "Q-path signal" output from/by their respective mixer units. Similarly, the AGC 140 of Lin is incapable of detecting, estimating, or removing an imbalance or mismatch between the "I-path signal" and "Q-path signal" output from/by their respective mixer units.

The Examiner's several references to an element number "206" in "Lin fig. 1" (Office Action Pages 1, 4, 6, 7, 9) is not understood because Figure 1 of Lin does not appear to contain an element numbered "206" and Figure 2 of Lin contains an element "206" that is a "transceiver controller" having no apparent control over the value of any phase or gain element. Accordingly, applicant submits that Lin does not teach nor suggest any circuit configured to detect, estimate or remove any "mismatch" (or imbalance) between the I-Path and the Q-Path in the DCR Receiver of Lin and/or Takahashi. Instead, Lin teaches away from providing or adapting any circuit to detect, estimate, calibrate for, or remove any "mismatch" (or imbalance) between the I-Path and the Q-Path in a receiver (e.g., of Lin or Takahashi).

The Examiner has apparently interpreted the combination of elements 91 (square unit), 92 (square unit) and 620 (adder) in FIG. 5 of Takahashi as being a "mismatch estimation unit" (as to claim 7), while at the same time acknowledging that "Takahashi fails

to teach a mismatch estimation unit that estimates" a (phase or gain) mismatch. See, Office Action Pages 2 & 3. Even if assuming, arguendo, that the interconnections and arrangement of elements 91 (square unit), 92 (square unit) and 620 (adder) in FIG. 5 of Takahashi is similar to the interconnections and arrangement of square units and an adder of the exemplary "mismatch estimation unit" of the present invention (as claimed in claim 7), the elements 91 (square unit), 92 (square unit) and 620 (adder) in FIG. 5 of Takahashi are not configured nor operated by Takahashi in manner that would result in detection, estimation, or removal of any (gain or phase) mismatch between I-Path and Q-Path signals. Instead, according to Takahashi, in the receiver of Takahashi, "the synchronization acquisition judgment circuit 630 judges from the output of the adder 620 whether or not the synchronization acquisition is achieved."

> Further, Takahashi explains, "a synchronization acquisition detection is performed according to the equation (17) by using a value obtained by the adder 620. Namely, the adder 620 adds up outputs of the squaring devices 91 and 92 which calculate the square of a value of the correlation detected by the correlator 81 and that of a value of the correlation detected by the correlator 83, respectively."

While the reliability of the performance of the "synchronization acquisition judgment circuit 630" of Takahashi might be adversely affected by any "mismatch" in the I-Path and Q-Path signals of Takahashi, the "synchronization acquisition judgment circuit 630" is not adapted to USE any measurement, estimation, or detection of such a "mismatch", and thus (with or without Lin) the combination of elements 91 (square unit), 92 (square unit) and 620 (adder) in FIG. 5 of Takahashi cannot be fairly characterized as a "mismatch estimation unit that estimates" a mismatch. Also, it is not apparent that the outputs of "correlators" 81 and

84 in FIG. 5 of Takahashi would not obscure or distort or impede a measurement or estimation of mismatch. Further, it may be that the "sensitivity" of the combination of elements 91 (square unit), 92 (square unit) and 620 (adder) in FIG. 5 of Takahashi would be adapted or optimized for comparisons of transmitted SIGNAL correlations, and not for estimation of circuit-generated "mismatches." Thus, nowhere in either Takahashi or Lin is there any teaching or suggestion of "a mismatch estimation unit that estimates ... mismatch" between I-Path and Q-Path signals, essentially as claimed in claims 1, 9, 16, and 22. Thus, applicant respectfully submits that independent claims 1, 9, 16, and 22 and the dependent claims depending from them are NOT rendered unpatentable over Takahashi in view of Lin.

Similarly, nowhere in either Takahashi nor in Lin is there any teaching or suggestion of a variable gain adjuster "for calibrating for" the gain "mismatch" of (e.g., "introduced" by) the poly-phase filter itself, essentially as claimed in independent claim 28. Thus, it is believed that independent claim 28 is NOT unpatentable over Takahashi in view of Lin.

Further, the Applicant respectfully disagrees with the Examiner's various remarks that either Takahashi or Lin, or their combination, teach first and second local oscillators having "a phase difference of 90 degrees PLUS a first variable calibration factor". Figure 5 of Takahashi plainly shows first and second local oscillators having "a phase difference of 90 degrees" without "a first variable calibration factor". Phase-shifting element 52 in Fig. 5 of Takahashi shows that the first and second oscillators have a phase difference of "π/2" (i.e., 90 degrees). Similarly, the phase-shifting elements 112 and 132 in Fig. 1 of Lin show that the first and second oscillators and third and fourth oscillators have a phase difference of "90" (i.e., 90 degrees). Nowhere in either Takahashi nor in Lin is there any teaching or

suggestion of first and second local oscillators having "a phase difference of 90 degrees PLUS a first variable calibration factor" (as claimed in originally dependent claims 3, 4, 5, 7, 18) and in independent claim 28.

The poly-filter presently claimed generates in-phase differential signal and a quadrature-phase differential signal derived from a received RF signal. Takahashi employs a low pass filter (41, 42), which filters the base-band signal from the down-conversed signal and Takahashi's transceiver controller (106 or 206) only controls DC offset and therefore does not control the phase nor gain mismatch.

As explained in the Summary of the Invention of the present application, "The phase difference of the second local oscillation signal and the first local oscillation signal is 90° plus [or minus] a phase calibration factor....", and the mismatch estimator unit estimates phase mismatch caused by the on-phase and quadrature phase signals. Therefore, on at least this basis, the Applicant respectfully disagrees with the Examiner's conclusion that dependent claims 3 (now independent claim 3), 4, 5, 7, 18 and independent claim 28 are unpatentable over Takahashi in view of Lin.

Similarly, each of dependent claims 8 and 18 includes the feature that the phase difference between at least one pair of local oscillators "varies in response to the signal output from the mismatch estimation unit." Nowhere in either Takahashi nor in Lin is there any teaching or suggestion of first and second local oscillators having a phase difference that "varies in response to the signal output from the mismatch estimation unit" (as claimed in dependent claims 8 and 18, 28.

Similarly, each of dependent claim 5 and independent claim 28 includes at least one pairing of "a 90° phase shifter" together with a "variable phase shifter for shifting the output signal of the 90° phase shifter by the first variable phase calibration factor" to generate a second local oscillation signal from a first local oscillation signal. Nowhere in either Takahashi nor in Lin is there any suggestion of a "variable phase shifter for shifting the output signal of the 90° phase shifter by [a] variable phase calibration factor" to generate a second local oscillation signal from a first local oscillation signal. Therefore, on at least this basis, the Applicant respectfully disagrees with the Examiner's conclusion that dependent claim 5 (now depending from independent claim 3) and in independent claim 28 are unpatentable over Takahashi in view of Lin. The Applicant respectfully submits that without such a variable phase-shifter, there is no way for "calibration" or adjustment for phase "mismatch" to be performed in either the DCR of Takahashi and/or Lin.

Therefore, Takahashi et al., (U.S. Patent 6,5,488,629) and Lin et al. (US Pat. Appl. # 2004/0038649), alone or in combination, fail to teach or suggest claims 1-29. The Examiner's reconsideration of the rejection is respectfully requested.

For the forgoing reasons, the application, including pending claims 1-29, is believed to be in condition for allowance. Early and favorable reconsideration of the case is respectfully requested.

Respectfully submitted,

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